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<p>(54) Title: REMOTE CONTROL OF ELECTRONIC LOCKING SYSTEMS</p> <pre> graph TD 1[1 Wide Area Pager Network] --> 2[2 PTMN Telephone Network] 2 --> 3[3 Modem] 3 --> 4[4 Local Computer] 5[Paging Receiver] --> 6[Decoder] 6 --> 7[Control Means] 7 --> 8[Electronic Lock(s)] </pre>		
<p>(57) Abstract</p> <p>A control unit (6) is electronically connected to an electronic lock (7) and adapted to receive radio signals via a paging receiver (4). The control unit (6) is activated by a code comprising a receiver identification code (RIC) and site identification code (SIC). A control signal is produced when the control code corresponds with a control code recognized by the control unit (6), and enables/disables the electronic lock keypad connected to the control unit. The control system integrates control units with central control and communication elements (i.e., a paging, telecommunications, or two-way radio network). Thus, individual electronic locks or systems, each with its own control unit, may be remotely controlled by transmission of appropriate control codes. In addition, each control unit may receive security status information relating to the lock, door, keypad and/or lock environment, and transfer that security status information to the central control means, enabling interactive lock control.</p>		

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REMOTE CONTROL OF ELECTRONIC LOCKING SYSTEMS

TECHNICAL FIELD

This invention relates to the control of electronic locks, and in particular to a method and apparatus for remotely controlling such locks or a system of such locks.

BACKGROUND ART

Electronically controlled locking systems are in common use, particularly, for example in banking for the control of safes or vaults.

Bank safes or vaults incorporating electronic locks are generally controlled from a key pad electronically connected to the lock. In addition, some systems may include overriding control of the key pad via, for example, a computer operated system which permits interference with control of the lock by the key pad. Thus, for example, at predetermined times, or in emergencies, the key pad may essentially be electronically disengaged from the lock so that entering the usual code will not open the lock.

One disadvantage of such a system is that the key pad remains operable although not operational. In the event of an emergency, for example robbery, a frustrated robber seeing an apparently functional key pad might believe that the operator was deliberately frustrating the robbers attempt to have the safe opened rather than believing that the safe was unopenable.

Furthermore, conventional security systems operating on electronic locks will only operate on one lock at a time or on a network of electronically

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connected locks. There are, however, circumstances under which an organisation may wish to influence all electronic locks under its control, or all locks in a particular area, at the same time.

Conventional security systems also tend not to be effectively integrated into a centrally managed system which enables the owner or their agent to be able to monitor all locks in a system and have overriding control of all locks in that system.

Thus, it is an object of the present invention to provide an apparatus and method for the remote control of electronic locks which reduces or overcomes the above mentioned problems, or which at least provides the public with a useful alternative.

Other objects of the present invention may become apparent from the following description which is given by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided a control unit adapted to control one or more electronic locks, comprising:

- a communication means adapted to receive radio waves,
- a decoder having a receiver identification code (RIC), a
- control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes, and electronically connected to one or more electronic locks,

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said control unit activated by receipt of a transmission code including the RIC and SIC, and when activated said control unit extracts a control code accompanying said transmission code, said control code decoded by the decoder, and if the decoded control code corresponds with one or more of the specified decoded control codes of the control means then said control means produces a control signal to effect an operation on the or each electronic lock.

In a preferred form of control unit of the invention the control signal may control the power supply to the electronic lock or locks, and may further effect an operation on the or any associated keypad.

Preferably the communication means may comprise a receiver/transmitter.

Preferably, the control means may be further adapted to monitor security status information relating to the electronic locks(s) and/or associated keypad(s) and/or their environment, and to relay such security status information to the communication means for transmission.

According to a further aspect of the present invention there is provided a control system adapted to provide remote control of one or more electronic locks, comprising:

- first communication means;

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- actuating means adapted to enable the entry of a digital data control sequence, comprising a transmission code and a control code, for transmission by the first communication means; and
- one or more control units, the or each unit comprising a second communication means adapted to receive radio waves, a decoder having a receiver identification code (RIC) common to all units in the system, and control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes, and electronically connected to one or more electronic locks and/or their associated keypads, the or each said control unit activated by receipt of transmission from the first communication means of a transmission code including the RIC, such that one or more selected control means recognising its SIC in the transmission code will extract a control code accompanying the transmission code, said control code decoded by the corresponding decoder of selected control means, and if the decoded control code corresponds with a specified decoded control code of the selected control means, then said control means produces a control signal to effect an operation on the or each of its associated electronic locks.

In one preferred form the actuating means may comprise a standard public switch telephone network telephone set. Alternatively, it may comprise a computer.

In a further preferred form of control system of the present invention the first and second communication means may comprise a pager network.

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In an alternative form the first and second communication means may together comprise a two-way radio communication network.

According to a further aspect of the present invention there is provided a centralised management system adapted to monitor and provide remote control of one or more electronic locks, comprising:

- a central control means adapted to receive and process security status information, and to generate or enable the generation of digital data control sequences, comprising transmission codes and control codes;
- communication means, enabling two-way communication between said central control means and one or more electronic lock controllers;
- one or more electronic lock controllers, each said controller comprising a decoder having a receiver identification code, (RIC) common to all controllers in the system, and local control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes, electronically connected to one or more electronic locks and/or their associated keypads, and adapted to receive and transfer security status information to the central control means via the communication means; and
- security status monitoring means adapted to supply security status information to the local control means;

and wherein one or more electronic locks in the system, and/or their associated keypads, may be controlled remotely and in accordance

with security status information, by the transmission, via the communication means, of a transmission code including the RIC which activates the controllers such that one or more selected controllers recognising its/their SIC in the transmission code will extract a control code accompanying the transmission code, said control code decoded by the corresponding decoder of the selected controllers, and if the decoded control code corresponds with a specified decoded control code of the local control means then said local control means produces a control signal to effect an operation on the electronic lock(s) and/or associated keypad(s).

According to a further aspect of the invention there is provided a method a method of controlling one or more electronic locks remotely, said method comprising:

- monitoring security status information relating to one or more electronic locks and/or their environment via electronic lock controllers,
- transferring said security status information to a central control means via communication means, for processing,
- transmitting a digital data control sequence comprising a transmission code and a control code, said transmission code including a receiver identification code (RIC) and site identification code (SIC), via said communication means, from the central control means to activate one or more electronic lock controllers having an RIC corresponding with that transmitted,

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- selecting electronic lock controllers preprogrammed to match the transmitted SIC,
- decoding the control code received by the selected controllers,
- recognising specified decoded control codes in the or each controller and producing a control signal in response to the specified decoded control code, and
- effecting an operation on the one or more electronic lock(s) and/or their keypad(s), connected to the controller via the control signal.

Other aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying figures.

BRIEF DESCRIPTION OF FIGURES

Figure 1:

Is a flow diagram showing the components and structure of a control system for electronic locks of the present invention, in one preferred form.

Figure 2:

Is a flow diagram of a control system of the present invention, in one preferred form, interconnected with a lock.

Figure 3:

Is a flow diagram similar to Figure 2 in which the control system is interconnected to a lock and associated keypad.

Figure 4:

Is a flow diagram of a centrally managed control system for electronic locks, according to one aspect of the present invention.

MODES FOR CARRYING OUT THE INVENTION

The apparatus and method of the present invention are used to remotely control the inbuilt features, including disablement and enablement, of a single or group of electronic locks and/or their associated keypads, if any. Remote control of the locks may be achieved through the use of a wide area or local radio paging-type receiver with the ability to receive transmitted control codes. Alternatively, a two-way receiver/transmitter communication means may be employed.

The control codes may disable and enable individual locks, groups of locks, or all locks, within specified groups by interrupting the power source to the locks, and/or may introduce changes in control of keypads associated with each lock, for example by remotely changing the access code or combination.

Referring to figure 1, a system of the present invention may comprise a pager network 1, which may be controlled by local telephone 2 and/or computer 3, one or more paging receivers 4, and associated with the or each receiver 4, a decoder 5, a control means 6 and an electronic lock 7.

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The pager network 1 may be a wide area pager network as used by the public in transmission and reception of information to remote pager receivers. It may alternatively be a two-way communication system, such as a two-way radio communication network. In the latter case information about the status of each lock and its associated environment (security status information), could be transmitted back to the computer (Figure 1) or centralised dispatcher bureau (Figure 4).

Referring again to Figure 1, control messages transmitted by the pager network 1 may be actuated either by a standard public switch to telephone network (PSTN) telephone set or by a control system installed on a computer electronically connected to the paging network via a modem link. In either event, a digital data control sequence or control message is entered on the key pad of the telephone or entered or generated via the computer. This control message essentially comprises two elements, a transmission code and a control code or codes.

The transmission code comprises a Receiver Identification Code (RIC) and a Site Identification Code (SIC), and is structured such that locks may be targeted globally, by group or individually.

The receiver 4 receives a transmission code. If the RIC corresponds with the RIC of the decoder 5 then the decoder 5 is activated and extracts or receives the SIC and control code. The control means 6 is electronically connected to one or more electronic locks and is programmed to match an SIC and to recognise specified control codes contained within the decoded

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control code. In response to such specified control codes the control means then transmits an appropriate control signal to the electronic lock or locks 7. This control signal will interfere with the power supply to the lock or locks. Essentially the control signal may act on a relay acting on the power supply to the lock or locks; one control code would cause interruption of the power supply and a second code would restore the power supply.

Thus, the control signal produced by the control means 6 may override any time delay features and dual combinations in a lock or locks, but it will not, under these circumstances, open or close the lock. It merely disables or enables the lock or locks, and therefore removes control of the lock from an authorised user.

Also, because the signal from the control means acts on the power supply to the lock, it will be apparent to any user or abuser that the lock and associated key pad have been disabled.

A control means of the present invention may be adapted to recognise a plurality of control codes and may be interconnected with the keypad as well as the lock itself. Each control code would be directed to the control of a particular function of a lock or its associated keypad. By this means the control system of the present invention may, for example, change the access code to a lock or locks, and operate the opening and closing of locks in addition to enabling and disabling the locks.

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Referring now to Figures 2 to 4, it can be seen that a control means (corresponding with the control means 6 of Figure 1) of an electronic locks control system of the present invention may receive information about its lock and/or keypad and/or local environment for feedback to the computer at a remote location, as well as receiving and operating on control instructions from that remote source. In one embodiment the control means may be connected to an existing site alarm panel in a building. Such site alarm panels are generally connected by a telecommunication network to a centralised alarm bureau. Information transmitted from the control means to the site alarm panel could therefore be relayed to the computer at a centralised dispatcher bureau dedicated to the control of locks in a particular electronic locks control system or network. The centralised dispatcher bureau may be a station or office in the centralised alarm bureau, an independent organisation controlling any number of networks of electronic locks control systems, or simply an office or station in the offices of the owner of a particular network. Whatever the location, the centralised dispatcher bureau controls the computer and wide area communications network which transmits messages or codes to the control means.

Examples of information which may be received by the centralised dispatcher bureau via the site alarm panel may include: status of the lock, status of the door associated with the lock, "duress status" (i.e. an indication that the keypad has been tampered with or the lock opened without authority) and/or lock and door status of any security enclosure (for example where the controlled lock is on an automatic teller machine or vault itself in a secure enclosure; and if the door to the enclosure is not locked then the lock to the

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vault or safe may not be opened). Such information is described herein as "security status information".

It will be appreciated that with an electronic locks control system of the present invention incorporating a wide area transmitter/receiver communications network the security status information received by the control means may be transmitted back to the computer of the centralised dispatcher bureau without the need for a telecommunication link via a site alarm panel.

Figures 2 and 3 show, by means of flow diagrams, the information received by and transmitted from the control means. In the embodiment of Figure 2 the control means acts only to enable or disable its associated lock. In contrast in the embodiment of Figure 3 the control means may act to enable/disable its lock and may also provide centralised control of the access code or combination.

Remote control of the access code or combination to the lock, together with the transfer of information about the status of the keypad to the computer (see Figure 4) enables a system of the present invention to have a very high level of security by enabling rolling codes to be employed in the keypad, e.g. randomly generated access codes.

Furthermore, centralised combination control enables prompt and simultaneous changing of access codes or combinations to a lock or group of

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locks in appropriate circumstances, e.g. when an authorised employee leaves a company.

Whilst the invention has been described with reference to banking security, in particular bank vaults, automatic teller machines and the like, it will be appreciated that an electronic locks control system of the present invention has broad application for security in general, including building security, vendor machine security and the like.

It will also be appreciated that there may be any number of electronic locks in a control system of the present invention, in many different and dispersed locations. Essentially, each lock has its own receiver or transmitter/receiver, decoder and control means, and it is the transmission code which enables each lock to be uniquely or collectively controlled. When collectively controlled, it will be appreciated that the present control system enables substantially simultaneous remote control of a plurality of electronic locks at one or multiple sites within the scope of the pager or transmitter/receiver network.

Where in the foregoing description reference has been made to specific components and integers of the invention having known equivalents then such equivalents are herein incorporated as if individually set forth.

Although the invention has been described by way of example, and with particular reference to various embodiments thereof, it should be

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appreciated that variations and modifications may be made thereto without departing from the scope of the invention as herein defined.

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CLAIMS:

1. A control unit adapted to control one or more electronic locks, comprising:
 - a communication means adapted to receive radio waves,
 - a decoder having a receiver identification code (RIC), and
 - control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes, and electronically connected to one or more electronic locks,said control unit activated by receipt of a transmission code including the RIC and SIC, and when activated said control unit extracts a control code accompanying said transmission code, said control code decoded by the decoder, and if the decoded control code corresponds with one or more of the specified decoded control codes of the control means then said control means produces a control signal to effect an operation on the or each electronic lock.
2. A control unit according to claim 1 wherein the control signal controls the power supply to the electronic lock or locks.
3. A control unit according to either claim 1 or claim 2 wherein the control signal effects an operation on the electronic lock and/or any associated keypad.
4. A control unit according to any one of claims 1 to 3 wherein the communication means comprises a receiver/transmitter.

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5. A control unit according to claim 4 wherein the control means is further adapted to monitor security status information relating to the electronic lock(s) and/or keypad(s) and/or their environment, and to relay said security status information to the communication means for transmission.
6. A control unit according to claim 5 wherein the security status information includes lock status, door status (in which the lock is located), keypad operation status, and/or security enclosure status, including status of an external door and/or external door lock of an access door to any security enclosure of the electronic lock.
7. A control system adapted to provide remote control of one or more electronic locks, comprising:
 - first communication means;
 - actuating means adapted to enable the entry of a digital data control sequence, comprising a transmission code and a control code, for transmission by the first communication means; and
 - one or more control units, the or each unit comprising a second communication means adapted to receive radio waves, a decoder having a receiver identification code (RIC) common to all units in the system, and control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes, and electronically connected to one or more electronic locks and/or their associated keypads,

the or each said control unit activated by receipt of transmission from the first communication means of a transmission code including the RIC, such that one or more selected control means recognising its SIC in the transmission code will extract a control code accompanying the transmission code, said control code decoded by the corresponding decoder of selected control means, and if the decoded control code corresponds with a specified decoded control code of the selected control means, then said control means produces a control signal to effect an operation on the or each of its associated electronic locks.

8. A control system according to claim 7 wherein the control signal controls the power supply to the electronic lock or locks.
9. A control system according to either claim 7 or claim 8 wherein the control signal effects an operation on the electronic lock and/or any associated keypad.
10. A control system according to any one of claims 7 to 9 wherein the actuating means comprises a standard public switch telephone network telephone set.
11. A control system according to any one of claims 7 to 10 wherein the first and second communication means comprise a pager network.
12. A control system according to any one of claims 7 to 9 wherein the first and second communication means together comprise a two-way

radio communication network.

13. A control system according to claim 12 wherein the actuating means comprises a computer.
14. A control system according to claim 13 wherein the each or each control means is further adapted to monitor security status information relating to the electronic lock(s) and/or keypad(s) and/or their environment, and to relay said security status information to the second communication means for transmission to the first communication means and monitoring/processing by said computer.
15. A centralised management system adapted to monitor and provide remote control of one or more electronic locks, comprising:
 - a central control means adapted to receive and process security status information, and to generate or enable the generation of digital data control sequences, comprising transmission codes and control codes;
 - communication means, enabling two-way communication between said central control means and one or more electronic lock controllers;
 - one or more electronic lock controllers, each said controller comprising a decoder having a receiver identification code, (RIC) common to all controllers in the system, and local control means programmed to match a site identification code (SIC), to respond to one or more specified decoded control codes,

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electronically connected to one or more electronic locks and/or their associated keypads, and adapted to receive and transfer security status information to the central control means via the communication means; and

- security status monitoring means adapted to supply security status information to the local control means;

and wherein one or more electronic locks in the system, and/or their associated keypads, may be controlled remotely and in accordance with security status information, by the transmission, via the communication means, of a transmission code including the RIC which activates the controllers such that one or more selected controllers recognising its/their SIC in the transmission code will extract a control code accompanying the transmission code, said control code decoded by the corresponding decoder of the selected controllers, and if the decoded control code corresponds with a specified decoded control code of the local control means then said local control means produces a control signal to effect an operation on the electronic lock(s) and/or associated keypad(s).

16. A centralised management system according to claim 15 wherein the communication means comprises transmitting means associated with the central control means and adapted to transmit radio frequency signals to receiving means associated with the or each electronic lock controller, and a telecommunication network for transmitting security status information from the electronic lock controllers to the central control means.

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17. A centralised management system according to claim 15 wherein the communication means comprises a two-way radio communication network.
18. A centralised management system according to any one of claims 15 to 17 wherein the security status information comprises electronic lock status, door status for the door secured by the electronic lock, keypad operation status, and/or security enclosure status including status of an external door and/or door lock of an access door to any security enclosure of the electronic lock.
19. A method of controlling one or more electronic locks remotely, said method comprising:
 - monitoring security status information relating to one or more electronic locks and/or their environment via electronic lock controllers,
 - transferring said security status information to a central control means via communication means, for processing,
 - transmitting a digital data control sequence comprising a transmission code and a control code, said transmission code including a receiver identification code (RIC) and site identification code (SIC), via said communication means, from the central control means to activate one or more electronic lock controllers having an RIC corresponding with that transmitted,
 - selecting electronic lock controllers preprogrammed to match the transmitted SIC,

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- decoding the control code received by the selected controllers,
- recognising specified decoded control codes in the or each controller and producing a control signal in response to the specified decoded control code, and
- effecting an operation on the one or more electronic lock(s) and/or their keypad(s), connected to the controller via the control signal.

20. A method according to claim 19 wherein the communication means comprises a two-way radio communication network.

21. A control unit adapted to control one or more electronic locks substantially as herein described and with reference to the accompanying figures.

22. A control system adapted to provide remote control of one or more electronic locks substantially as herein described or with reference to the accompanying figures.

23. A centralised management system adapted to monitor and provide remote control of one or more electronic locks substantially as herein described and with reference to the accompanying figures.

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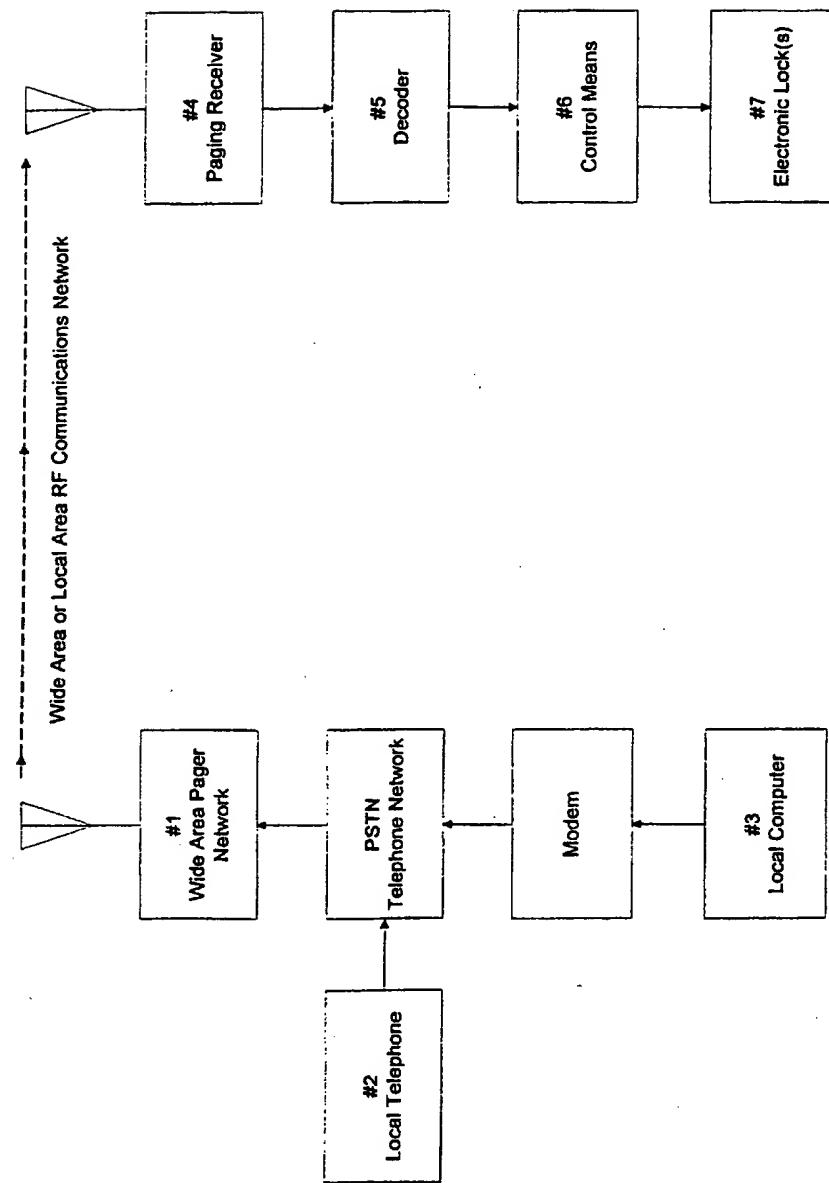


FIG 1

2 / 4

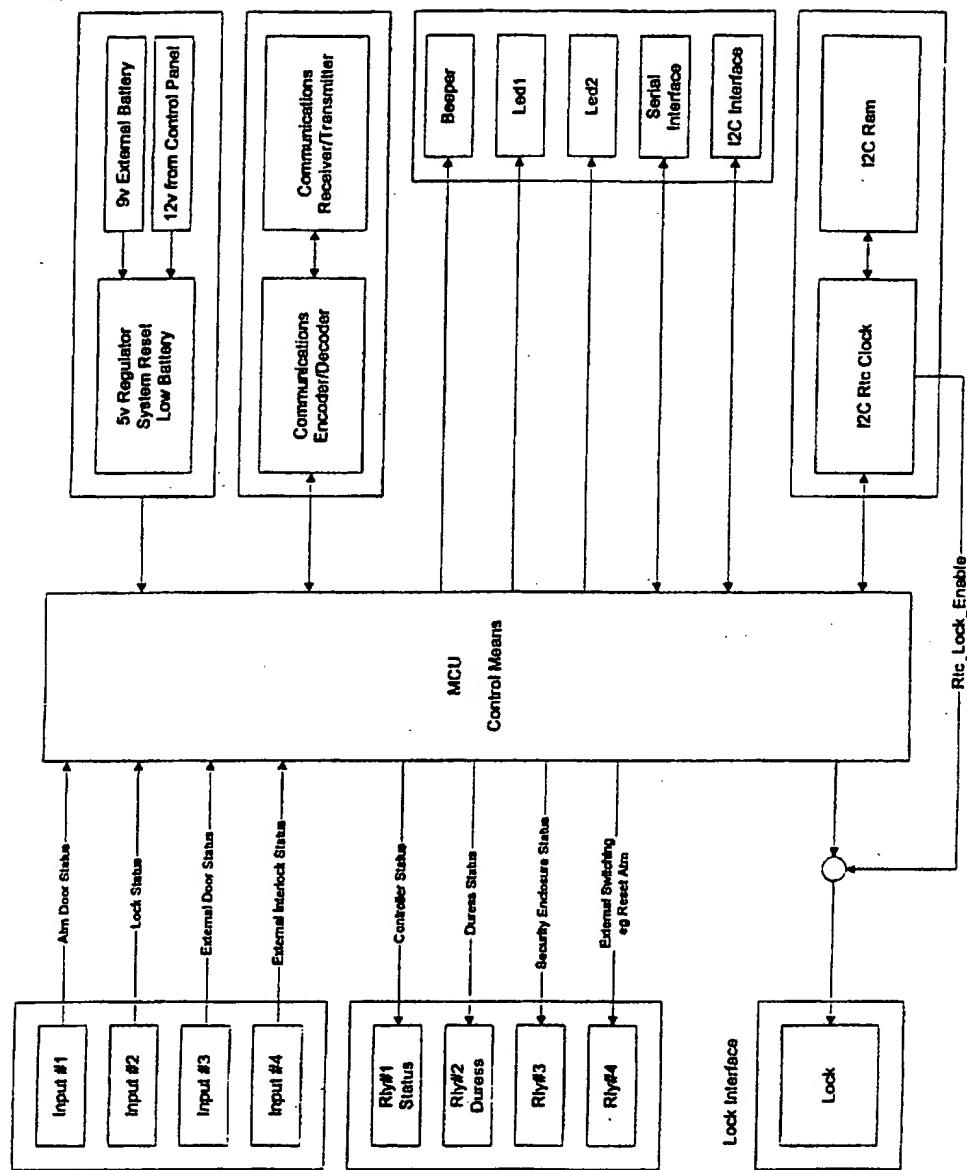


FIG 2

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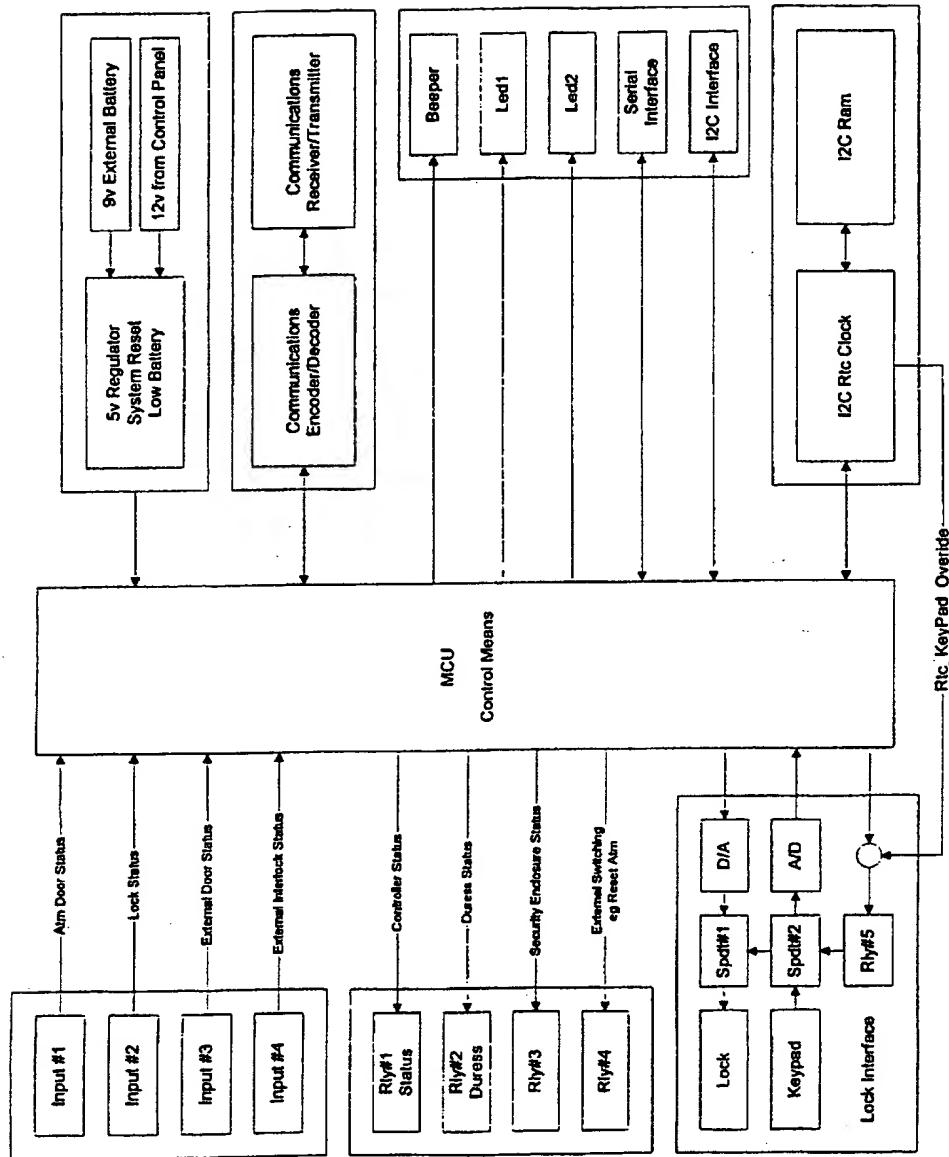


FIG 3

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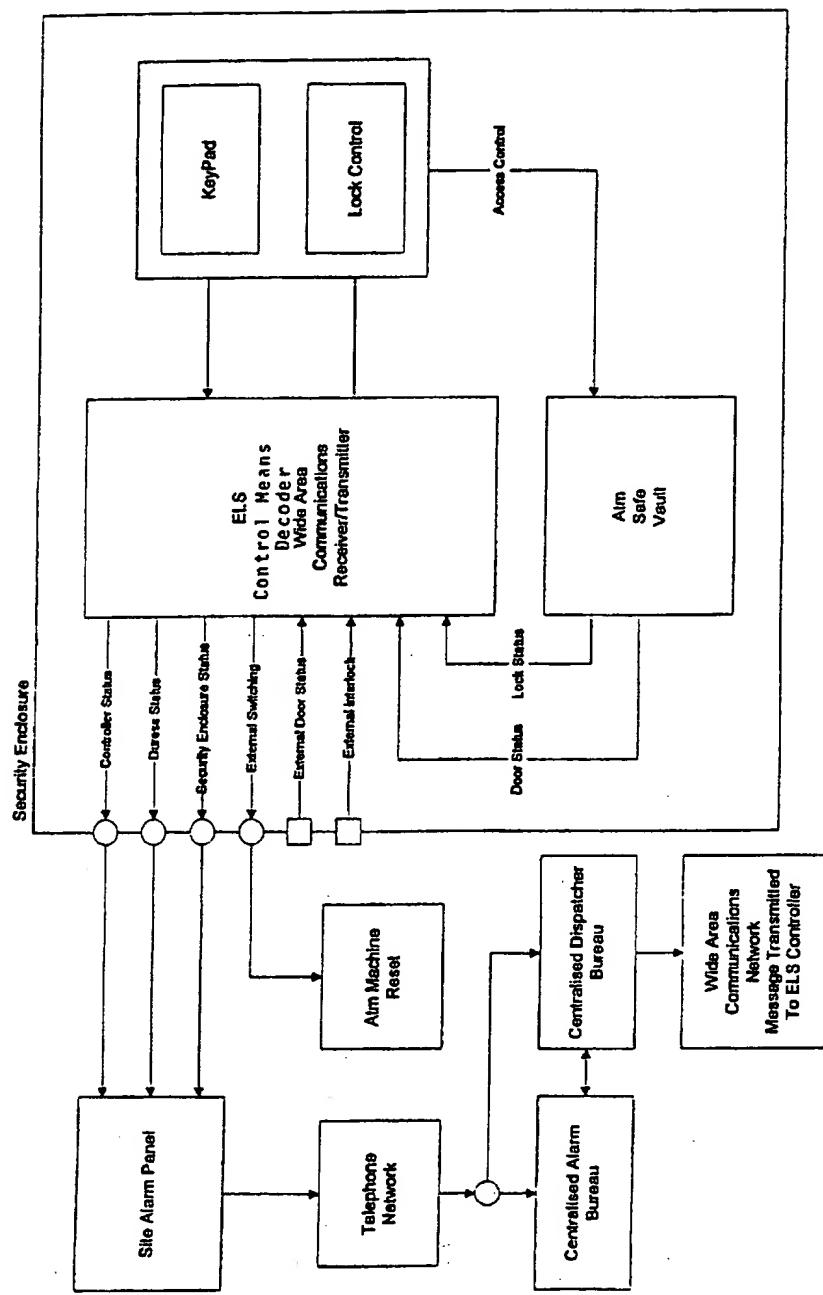


FIG 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ96/00147

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :E05B 49/04

US CL :340/825.31

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/825.31, 825.72, 825.69, 825.5; 235/382, 235; 379/103; 361/172; 70/278, 264, 432

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS MESSENGER

Search Terms: electric, electronic, lock(s), radio, rf, wireless, code(s)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, 4,727,369 A (RODE et al) 23 February 1988. Figs. 1-6.; Col. 2, line 42--Col. 4, line 8.	1-23
Y	US, 5,397,884 A (SALIGA) 14 March 1995 Figs. 1-8; Col. 4, line 13--Col. 9, line 59.	1-23

 Further documents are listed in the continuation of Box C. See patent family annex.

• Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search	Date of mailing of the international search report
06 APRIL 1997	24 APR 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer WILLIAM H. WILSON, JR. Telephone No. (703) 308-5459
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